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I-BEAM MOUNTED WORK LADDER

Background of the Invention

(1) Field of the Invention

This invention pertains to the field of ladder assemblies. More particularly, this invention pertains to a ladder assembly that is adapted and configured to be removably secured to an I-beam.

(2) Background

I-beams are commonly used as structural supports. In some cases, I-beams are elevated above a floor or ground level and scaffolding or the like is suspended therefrom to provide access to an elevated work area. This is common in military aircraft service areas, where portions of aircraft being serviced are elevated from the floor or ground level, thus

requiring workers to elevate themselves via such scaffolding or with ladders. While step ladders and scaffolding certainly serve the purpose of elevating the worker, they are sometimes unstable and do not provide an adequate work surface.

In view of the foregoing, the inventor has appreciated the desirability of providing a support structure that is adapted and configured to be removably attached to and supported by a single I-beam. Additionally, the inventor has appreciated the desirability of providing a platform and a ladder attached to such a support structure in a manner to provide a surface upon which a worker can stand and a means for such worker to access the platform from ground level.

Summary of the Invention

In general, a support structure in accordance with the invention comprises a first clamping member, a second clamping member, a ladder and a support platform. The support structure is adapted for use with an elevated I-beam having a generally vertical web, a generally horizontal upper flange at an upper end of the web, and a generally horizontal lower flange at a lower end of the web. The upper flange, web, and lower flange define a first channel of the I-beam on a first side of the web and a second channel of the I-beam on an opposite second side of the web. The first clamping member

has a beam-engaging portion that is configured and adapted to be positioned within the first channel of the I-beam. The second clamping member has a beam-engaging portion that is adapted to be positioned within the second channel of the I-beam. The second clamping member is movably connected to the first clamping member in a manner such that the first and second clamping members are moveable relative to each other between a clamped configuration and an unclamped configuration. In the clamped configuration, at least a portion of the web of the I-beam are clamped between the beam-engaging portions of the first and second clamping members. In the unclamped position, the beam-engaging portions of the first and second clamping members are sufficiently spaced from one another to permit disengagement of the support structure from the I-beam. The ladder is attached to one of the first and second clamping members, and the support platform is attached to the other of the first and second clamping members.

In another aspect of the invention, a support structure comprises a first clamping member and a second clamping member. The support structure is adapted for use with an I-beam having a generally vertical web, a generally horizontal upper flange at an upper end of the web, and a generally horizontal lower flange at a lower end of the web. The upper

flange, the web, and the lower flange define a first channel with a generally C-shaped first channel surface on one side of the web and a second channel with a generally C-shaped second channel surface on an opposite side of the web. The first clamping member has a beam-engaging portion that is dimensioned to mate with the first channel surface. The second clamping member has a beam-engaging portion that is dimensioned to mate with the second channel surface. The second clamping member is pivotally connected to the first clamping member in a manner so that the first and second clamping members are moveable relative to one another between a clamped configuration and an unclamped configuration. In the clamped configuration, the first and second clamping members are mated with the first and second channel surfaces, respectively. In the unclamped configuration, the beam-engaging portions of the first and second clamping members are sufficiently spaced from one another to permit disengagement of the support structure from the I-beam. The pivotal connection of the first and second clamping members is located generally adjacent the upper flange of the I-beam when the support structure is secured to the I-beam and is in the clamped configuration. Therefore, the weight of the first clamping member results in a generally horizontal force being exerted inwardly against the first channel surface by the

beam-engaging portion of the first clamping member, and the weight of the second clamping member results in a generally horizontal force being exerted inwardly against the second channel surface by the beam-engaging portion of the second clamping member, when the support structure is secured to the I-beam and is in the clamped configuration.

In still another aspect of the invention, a support structure for use with an elevated I-beam comprises a ladder and a support platform. The ladder has a pair of generally parallel side rails with a plurality of generally horizontal steps extending therebetween. The ladder has a first clamping member connected to an upper end of at least one of the side rails. The first clamping member has a beam-engaging portion that is dimensioned to mate with a generally C-shaped first channel surface of the I-beam. The support platform has a generally horizontal support surface that is of sufficient area to support a worker situated thereon. The support platform has a second clamping member with a beam-engaging portion that is dimensioned to mate with the C-shaped second channel surface of the I-beam. The second clamping member is pivotally connected to the first clamping member in a manner so that the first and second clamping members are relative to each other between a clamped configuration and an unclamped configuration. In the clamped configuration, the first and

second clamping members can be mated with the first and second channel surfaces, respectively. In the unclamped configuration, the beam-engaging portions of the first and second clamping members are sufficiently spaced from one another to permit disengagement of the support structure from the I-beam.

In yet another aspect of the invention, a method comprises a step of providing an I-beam having a generally vertical web, a generally horizontal upper flange at an upper end of the web, and a generally horizontal lower flange at a lower end of the web. The upper flange, the web, and the lower flange of the I-beam define a first channel with a generally C-shaped first channel surface on one side of the web and a second channel with a generally C-shaped second channel surface on an opposite side of the web. The method further includes a step of providing a support structure that comprises first and second clamping members, a ladder, and a platform. The first clamping member is movably connected to the second clamping member. Furthermore, the method comprises a step of removably securing the support structure to the I-beam by moving the first clamping member relative to the second clamping member in a manner such that a portion of the first clamping member is positioned within the first channel of the I-beam and a portion of the second clamping member is

positioned within the second channel of the I-beam such that the support structure is in interlocked geometry with the I-beam. Additionally, the method comprises a step of removing the support structure from the I-beam by moving the first clamping member relative to the second clamping member in a manner positioning the first and second clamping members outside of the first and second channels of the I-beam.

Other features of the invention will be in part apparent and in part pointed out hereinafter. While the principal advantages and features of the present invention have been described above, a more complete and thorough understanding and appreciation for the invention may be attained by referring to the drawings and detailed description of the preferred embodiment, which follow.

Brief Description of the Drawings

Figure 1 is a perspective view of a preferred embodiment of a support structure in accordance with the invention, shown mounted to an I-beam.

Figure 2 is a side elevation view of the support structure of Figure 1.

Figure 3 is a perspective view of the preferred embodiment of a support structure shown in Figure 1, shown with its support platform pivoted relative to its ladder

portion in a manner allowing the support structure to be removed from the an I-beam.

Figure 4 is a side elevation view of the support structure of Figure 3.

Reference characters shown in these Figures correspond to reference characters used throughout the following detailed description of the preferred embodiment.

Detailed Description of the Preferred Embodiment

The preferred embodiment of a support structure in accordance with the invention is shown in Figures 1-4. In general, the support structure 10 comprises first 12 and second 14 clamping members that are movably connected to each other. The various components of the support structure 10 are preferably formed of aluminum or other suitably strong and rigid materials.

The first clamping member 12 preferably comprises a beam-engaging portion 16 and a ladder 18. The beam-engaging portion 16 of the first clamping member 12 preferably comprises an elongate C-shaped member 20, a top plate member 22, and a pair of brackets 24. The top plate member 22 preferably comprises a hinge member 26 along one of its longitudinal edge margins and is preferably attached to the top of the C-shaped member 20 along its opposite edge margin.

The C-shaped member 20 comprises a top portion 28, an intermediate portion 30, and a bottom portion 32 that together form a channel 34. Each of the brackets 24 preferably extends outwardly in a cantilevered manner from within the channel 34 of the C-shaped member. Preferably, each bracket 24 is welded, or otherwise rigidly connected to each of the top 28, intermediate 30, and bottom 32 portions of the C-shaped member 20 so as to provide substantial stiffness between the brackets and the C-shaped member.

The ladder 18 of the first clamping member 12 preferably comprises a pair of spaced-apart rails 36 and a plurality of rungs or steps 38 spanning horizontally therebetween. The top end of each rail 36 is preferably rigidly attached to a respective one of the brackets 24. Preferably, the rails 36 are to the brackets 24 in a manner such that the rails extend downward and outward in an incline manner with respect to the top plate member 22 of the beam-engaging portion 16.

The second clamping member 14 of the support structure 10 preferably comprises a beam-engaging portion 40 and a support platform 42. Similar to beam-engaging portion 16 of the first clamping member 12, the beam-engaging portion 40 of the second clamping member 14 preferably comprises an elongate C-shaped member 44 and a pair of brackets 46. Likewise, the C-shaped member 44 preferably comprises a top portion 48, an

intermediate portion 50, and a bottom portion 52 that together form a channel 54. Furthermore, each of the brackets 46 is preferably rigidly connected to each of the top 48, intermediate 50, and bottom 52 portions of the C-shaped member 44 and extends outwardly in a cantilevered manner from within the channel 54. The support platform 42 is preferably rigidly connected to each of the brackets 46 and comprises a hinge member 56 along its longitudinal edge nearest the C-shaped member 44. The hinge member 56 of the second clamping member 14 is connected to the hinge member 26 of the first clamping member 12 and cooperates therewith in a manner such that the first and clamping members are pivotally connected to each other.

Configured as described above, the support structure is configured and adapted to be removably secured to and supported by an I-beam 58, as shown in the Figures. Such an I-beam 58 generally comprises a generally vertical web 60, a generally horizontal upper flange 62 teeing from the upper end of the web, and a generally horizontal lower flange teeing from the lower end of the web. As such, the upper flange 62, web 60, and lower flange 64 define a first channel 66 of the I-beam 58 on one side of the web and a second channel 68 of the I-beam on an opposite side of the web.

To secure the support structure 10 to the I-beam 58, the second clamping member 14 is pivoted upward relative to the first clamping member 12 in a manner as shown in Figures 3 and 4. In this configuration, the beam-engaging portion 16 of the first clamping member is then brought into engagement with the I-beam 58. In particular, the top plate member 22 of the first clamping member 12 is engaged against the top surface of the upper flange 62 of the I-beam 58, and the C-shaped member 20 of the first clamping member 12 is inserted into the first channel 66 of the I-beam. The second clamping member 14 is then pivoted downward relative to the first clamping member 12 in a manner such that the C-shape member 44 of the beam-engaging portion 16 of the second clamping member moves into the second channel 68 of the I-beam 58. The gravitational forces acting on the first 12 and second 14 clamping members acts to force the C-shaped members 20,44 of the first and second clamping members toward each other. The C-shaped members 20,44 of the first 12 and second 14 clamping members are preferably dimensioned such that they conform closely with first 66 and second 68 channels of the I-beam 58 so that each engages against the I-beam's upper flange 62, web 60, and lower flange 64. As such, the intermediate portion 30 of the C-shaped member 20 of the first clamping member 12 and the intermediate portion 50 of the C-shaped member 44 of the

second clamping member 14 press against the web 60 of the I-beam 58, and thereby secure the support structure 10 to the I-beam.

Once secured to an I-beam as discussed above, the support platform 42 of the second clamping member 14 provides a surface upon which workers can stand to access objects at heights above which they could reach when standing at lower elevations. Additionally, the ladder 18 of the first clamping member 12 is preferably configured to extend downward to an extent such that the lowermost step 38 is positioned a comfortable stepping distance above some other surface. As a person climbs the ladder 18 from such other surface, the weight of the person creates an additional force on the first clamping member 12 that creates a pulling force on the second clamping member 14 in a direction toward the first clamping member. However, the weight of the second clamping member 14 creates a clamping force against the I-beam 58 that is sufficiently high to resist movement of the support structure 10 relative to the I-beam when this occurs. Likewise, when a person stands on the support platform 42, the pulling force created on the first clamping member 12 is reacted by the reaction force created by the weight of the first clamping member.

When desired, the support structure 10 can be removed from the I-beam 58 by simply reversing the steps of attaching the support structure to the I-beam. Thus, it should be appreciated that the support structure 10 provides a simple and practical way for workers to utilize I-beams to elevate themselves.

While the present invention has been described in reference to a specific embodiment, in light of the foregoing, it should be understood that all matter contained in the above description or shown in the accompanying drawings is intended to be interpreted as illustrative and not in a limiting sense and that various modifications and variations of the invention may be constructed without departing from the scope of the invention defined by the following claims. Most notably, it should be appreciated that all of the elements or method steps described in reference to the preferred embodiment need be present or performed. Thus, other possible variations and modifications should be appreciated.

Furthermore, it should be understood that when introducing elements of the present invention in the claims or in the above description of the preferred embodiment of the invention, the terms "comprising," "including," and "having" are intended to be open-ended and mean that there may be additional elements other than the listed elements.

Similarly, the term "portion" should be construed as meaning some or all of the item or element that it qualifies.